Used for teaching at
York Univ., shortly
after '69 ... beginning ...
included for reference.

INFORMATION THEORY

David Rosenboom

Terms: Information, entropy, redundancy, uncertainty, average information, transmitted information or correlation measure, informational correspondence, stochastic processes, ergodic, correlational redundancy, distributional redundancy, positive interaction uncertainty, higher order redundancy (digrams, trigrams, etc.), isomorphism, iconicity, abstraction, distrotion, noise, relative entropy, multidimensional scaling, . . .

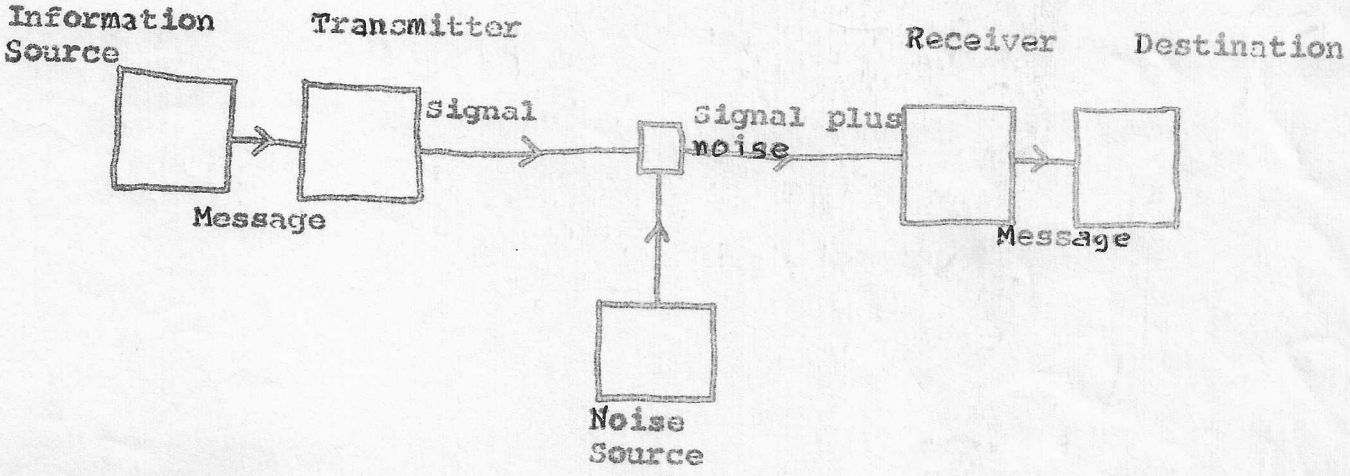
Basic relation:

$$H = -\sum_{i}^{i} p_i \log p_i \qquad \text{(Shannon)}$$

Relative Entropy: $R = H/H_{max} = H/\log(m)$

Redundancy: $C = 1-R$

Shannon's communication model:



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A. Review of basic facts about logarithms:

Primary fact: if, $N = x^p$, then $p = \log_x N$

Operations:

$(x^p)(x^q) = x^{p+q}$ $\qquad$ $x^p/x^q = x^{p-q}$

$\log MN = \log M + \log N$ $\qquad$ $\log M/N = \log M - \log N$

$\log M^p = p\log M$ $\qquad$ $\log \sqrt[p]{M} = 1/p(\log M)$

Know the meaning of: mantissa and characteristic.

B. Using log with base 2, assumed in information theory:

Basic fact: $\log_{10} 2 = 0.30103$

Deduce: $\log_2 10 = (\log_{10} 2)^{-1} = 3.322$

Exercises in log with base 2:

$\log(\frac{1}{4}, \frac{1}{2}, 0, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024) =$

Problems:

	Three place answers:
$\log(1000) \approx$	9.966
$\log(10^6) \approx$	19.932
$\log(100) \approx$	6.644
$\log(160) \approx$	7.322
$\log(3.16) \approx$	1.661
$\log(2.5) \approx$	1.322
$\log(5) \approx$	2.322
$\log(\sqrt[3]{2}) \approx$	1/3
$\log(25) \approx$	4.644
Deduce $\log(3) \approx$	1.585
$\log(\sqrt{2}) \approx$	$\frac{1}{2}$
$\log(80) \approx$	6.322
Deduce $\log(3) \approx$	1.585
$\log(50) \approx$	5.644
Deduce $\log(7) \approx$	2.807

Calculate the log of the integers between 1 and 25

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